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Part IV

UTILIZING THE PROTECTIVE PROPERTIES OF THE TERRAIN

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In January, 1954, the Soviet Ministry of Defense organ Krasnaya Zvezda (Red Star) began publishing a series of signed articles on atomic energy. The articles are of an elementary nature and were presumably intended to give the lay reader a basic background for understanding not only the military effects of atomic weapons but also the practical applications of atomic energy. Translations of these articles are available in the RAND T-35 series.

Early in August, 1954, the first article of a new series generally entitled "Atomic Weapons and Antiatomic Defense" appeared in Red Star. The first three articles were written by Prof. B. Olisov and were published on August 3, 4 and 6, respectively. Their importance from a military point of view is manifest by the fact that they were transmitted by radio broadcast to the Soviet Armed Forces in the Far East. The broadcasts were intercepted by U. S. monitors during the latter part of August.

The present article ~~is the fourth in the series and the first of three by Colonel A. Gladkov.~~ It is concerned with the problems of ascertaining and utilizing as protection, in case of atomic attack, such properties of the terrain as the relief (differences in elevation), woods, buildings, and other local objects. This article is free of the usual Soviet propaganda, but concludes with the following interesting sentence: "The training of Soviet soldiers in resoluteness, initiative, and a highly aggressive spirit is the most important task of all commanders and political workers."

F. J. Krieger

ATOMIC WEAPONS AND ANTIATOMIC DEFENSE*

1. Utilizing the Protective Properties of the Terrain

Combat operations of troops, as the experience of wars shows, are carried out on varied terrain the peculiarities of which are always taken into account by the commander when he makes a decision. Studying the terrain, the commander utilizes its properties for concealed movement and maneuver, and also for protection against enemy fire whether from the ground or from the air. Skillful utilization of the terrain enhances the combat activity of troops and greatly assists the achievement of success in any battle.

Under certain conditions the elements of the relief, woods and other local objects may serve the troops as shelters from the damaging effect of such a powerful weapon as the atomic weapon. In modern combat skilful utilization of the protective properties of the terrain is one of the duties of a commander.

To utilize the protective properties of the terrain it is, first of all, necessary to ascertain them. In this respect the work of the commander is similar to that which he performs when evaluating a situation. In this case also he must study the character of the terrain: the presence of heights, gullies, ravines, forests, etc., and determine those peculiarities of the terrain which can be utilized for the defense of troops against an atomic attack and, consequently, for enhancing their combat activity.

It is known that the objectives of an atomic attack in tactical and strategic depth most often will be combat formations, areas of troop concentration, positions of reserves, of command elements and other most important troop targets.

Certainly, while studying the terrain from the point of view of ascertaining its protective properties, it will be difficult for a commander to determine

*Krasnaya Zvezda, 25 August 1954, p. 2.

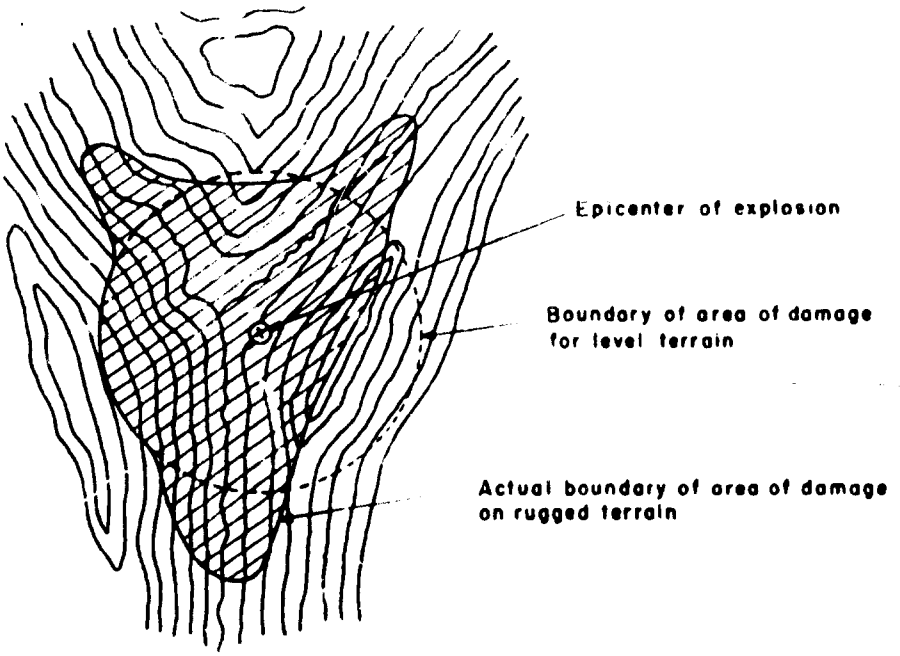
at what exact point the explosion of an atomic bomb, projectile, etc., will take place. Knowing, however, what objects may be subjected to an atomic attack, it is possible, even if only approximately, to foresee the possible spot of an atomic explosion. In conformity with this, it is also necessary to study the terrain. But to speculate about the protective properties of the terrain when it is not known even approximately where an atomic explosion may occur is completely aimless, because the very same steep slope of a height in one case may serve as a defense, if the explosion occurs on the other side of this height, and in another case it can act as a frontal wall taking the increased pressure of the shock wave, etc. Keeping the above in mind, let us examine what protective properties the terrain can possess.

A relief possesses protective properties if it is very rugged. Level or slightly broken terrain does not possess such properties, especially during an aerial atomic bomb explosion. Terrain, which has heights and ridges with steep slopes, ravines, gullies, etc., may be of interest for a commander who is organizing anti-atomic defense. Various excavations and embankments of railroads and highways are likewise of interest.

Steep slopes, precipices, inclines of excavations and embankments can form screens against both light and penetrating radiations. Moreover, they shield objects against the action of the velocity pressure of a shock wave. Besides, the nearer the objects of protection are to the base of steep slopes, the less probable is their damage and the greater are the commander's chances of saving them for battle.

Narrow and straight depressions should be avoided for deployment troops. It is precisely along such depressions that a shock wave travels farther than on a plane. Therefore, its destructive effect along such depressions will be considerably greater than under other conditions.

By examining an area which is affected by an atomic explosion on very rugged terrain, it is possible to notice that it is not a circle as, let us say, on level terrain, but has the most fantastic configuration, the boundaries of which are determined by both the relief itself and the height of the explosion. For a high aerial explosion of an atomic bomb the affected area will have fewer protected places, but at the same time the destructive action of the bomb will be considerably weaker. In low or surface explosions a rugged relief forms more shielded spots in which it is also possible to find protection against the action of both the shock wave and other destructive factors.



The diagram shows how the relief of the terrain influences the configuration of the affected area. We see that along valleys and depressions the distance from the epicenter of the explosion, over which destruction is possible, is considerably greater and that, on the contrary, steep slopes of heights reduce

these distances. Having determined, though only approximately, the possible point of an atomic explosion, it is possible to find on the terrain such areas which are not affected by the explosion or where the action of the atomic weapon will prove to be the least.

But it is not only the relief that can create conditions for weakening the destructive action of an atomic explosion. Forest-covered terrain also possesses good protective properties.

A forest, even on level terrain, can protect objects situated in it against the shock wave, light radiation, penetrating radiation and radioactive contamination. But at the same time it is necessary to keep in mind that the degree of protection against each kind of destructive action will not be equal.

The protective properties of a forest are determined, first of all, by its density, the thickness of the tree trunks, the species of the forest growth. The denser the forest, the closer the tree crowns; consequently they offer greater shielding against light radiation. In such a forest the dose of penetrating radiation is attenuated and the destructive action of the shock wave is also lessened. Objects within the forest will not experience the effect of the velocity pressure which is observed in open terrain during the passage of the shock wave. It is true that the excess air pressure under the tree crowns will be almost the same as that in the shock wave, but nevertheless its destructive action will be considerably lowered because of the absence of the velocity pressure.

It is necessary, however, when deploying troops and objects in a forest, to keep in mind that the shock wave will expand along cuttings, cleared spaces and glades with an increased destructive force. Therefore, they should always be avoided.

A forest gives the weakest protection against penetrating radiations. Near the epicenter of the explosion only the tree crowns, branches and leaves stand in the way of the penetrating radiations in a forest. But they show such an insignificant attenuation that they cannot be taken into account. Only at considerable distances from the epicenter of the explosion, when, besides the tree crowns, the tree trunks stand in the way, does the protection against the penetrating radiations become more substantial. Therefore, additional measures should always be taken for the protection of troops against the action of penetrating radiations.

When organizing defense in a forest another condition should also be kept in mind. As we said above, the crowns of the trees create shade, which protects the sheltered objects from the light radiation of an atomic explosion. But the crowns of the trees may ignite under its influence. This will cause fire to break out at the top. The outbreak and spread of fire is most likely in coniferous forests. A fire in the tree tops over a major part of an area enveloped by it, however, may be extinguished by the action of the shock wave which, at some distance from the epicenter of the explosion, arrives a little later than the termination of the influence of the light radiation. The velocity pressure of the shock wave extinguishes the flame, like a strong wind blows out and extinguishes a bonfire which begins to flare up.

An outbreak of fire at a lower level is also possible if light radiation strikes dry grass, leaves, conifer needles, windfall. A lower level fire is less subject to the subsequent action of the velocity pressure during the passage of the shock wave, and, therefore, it is not to be reckoned that it will be extinguished without outside intervention.

A lower-level fire spreads in a forest with an average speed of not more than 0.5 kilometer per hour. Therefore, it is possible to organize the

extinguishing of the fire and prevent its spreading. It is more expedient to take advance measures by clearing strips 5 to 10 meters wide of conifer needles, windfall and dry grass. These firebreaks will serve as reliable barriers against fire. It is expedient also to cut off the lower branches of conifers and small young fir and pine trees in the area of deployment of military objectives. Such measures will avert the spread of a low-level fire into a high-level and general conflagration.

When making use of the protective properties of a forest, it is necessary to take certain measures for protecting it against catching fire. This work does not present special difficulties and, if carried out, troops operating in a forest will have sufficiently dependable protection against the atomic weapon.

Local objects - embankments, excavations, ditches - can also serve as shelters for troops. The deeper and narrower the cover, the higher the degree of protection it gives.

One should especially consider the utilization of urban structures. In placing troops in populated points, basements should be utilized as covers. At the same time it is necessary to determine whether the ceiling above the cellar is sufficiently strong, whether it can sustain the load of falling fragments of a demolished building.

If it is not sufficiently strong, it must be reinforced by placing inside the cellar props that support the ceiling. Entrances to a cellar, which has been adapted for anti-atomic defense, should be equipped with strong doors capable of withstanding the action of a shock wave against them. In addition to the main entrance, it is necessary to provide an emergency exit through which it could be possible to get out in case of the collapse of the building and the destruction of the main entrance. Care should be taken that all

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openings and apertures are bricked up or covered with strong shields. Equipping a cellar with a filtering and ventilating system will ensure protection against outside air, contaminated with radioactive and chemically poisonous substances, coming inside the shelter.

It is concluded that the protective properties of the terrain can be ascertained only after a careful study of it, a good knowledge of the peculiarities of the relief which can resist the destructive action of an atomic explosion. Utilizing the protective properties of the terrain does not free troops from carrying on engineering work with respect to anti-atomic defense. Improvement of the protective properties of the terrain by building engineering structures must be carried out by troops uninterruptedly. This will raise the degree of their protection against atomic weapons, will promote the conduct of active combat operations. Only by means of bold offensive actions is it possible to crush the enemy. The training of Soviet soldiers in resoluteness, initiative, and a highly aggressive spirit is the most important task of all commanders and political workers.

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